

4.3 Accuracy Assessment

A total of 495 points were collected to assess the thematic accuracy of the vegetation map. These points were collected in September of 2001. The data and location of each point was collected with a GPS unit. All data was post-processed and overlaid on the vegetation map. Each point was attributed with the type of vegetation polygon it intersected. These points were then exported from the GIS to a spreadsheet for analysis.

Initial analysis showed a relatively low overall accuracy of 57.6%. Further examination revealed some fairly serious discrepancies between vegetation types classified in the field and those depicted on the map. When specific point locations were examined, we noted a high incidence of field assessors describing what appeared to be smaller, non-target polygons existing within larger mapped polygons. Often field notes indicated that the assessor has some question as to which polygon he or she were supposed to be describing, and also described larger polygons at the same location.

We decided to review each of the points individually. We were looking for points where the assessor felt they either couldn't adequately identify which polygon they were supposed to be describing, where the navigator was unsure about the actual point they were navigating to, or some problem with using the field key (see Appendix 7.12 for a detailed procedure). We also used the standard deviation of the GPS position to determine if discrepancies could be due to positional error. Each point was assigned a code to denote what decision was made regarding its subsequent use on the accuracy assessment (see Table 8). Points with problems in either classification or position were removed.

Table 8. Codes used to attribute points after post-field correction.

Code	Value
1	No corrections/modifications
2	Spatial Modifications
3	Thematic modification
4	Spatial and Thematic Change
5	Point removed

After review, 428 points were available for use in the accuracy assessment. Of these 329 were located in polygons larger than 0.25 ha and 99 were found in smaller polygons. These points were attributed with the vegetation code of the polygon it intersected. Because many of the associations contain similar suites of characteristic species, we decided to employ a fuzzy accuracy assessment. This will allow future users to evaluate errors in the map on an application-by-application basis.

We used a fuzzy set matrix to evaluate the severity of error between each class and every other class (Table 9). The fuzzy value was assigned based on the similarity between types observed on Fire Island (Appendix 7.13 contains detailed class-by-class justification for assignment of fuzzy levels). This similarity is evaluated from a user

standpoint and will not include confusion issues pertaining to vegetation interpretation or delineation. Each interaction is assigned a fuzzy level of accuracy as follows:

Table 9. Definitions of fuzzy set classifications.

Level	Description
5	Exact match; The associations are exactly the same.
4	Acceptable Error - mapped type has minor differences with type observed in the field; often species dominance or composition is very similar.
3	Understandable Error - mapped class does not match field point; types have structural or ecological similarity, or have similar species associates.
2	Vague Similarity - types seen in the field and on map match in Formation and structure, but species or ecological conditions are not similar.
1	Complete Error – the types have no conditions or structural similarity.

Once the fuzzy matrix was complete, we completed a contingency table. We present accuracy estimates for levels 5, 4 and 3 in the classification. The level 5 contains only those points where the observed type matched the mapped type exactly. The level 4 assessment considers both level 5 and 4 as being correct. The level 3 assessment similarly considers levels 5,4, and 3. We report the overall accuracy and Kappa statistic for each level of the analysis as well as the accuracy for all classes with 90% confidence intervals.

The overall accuracy (and Kappa index) for the map at level 5 was 66.3% (64%). The level 4 and 3 accuracy was 78.1% (77%) and 87.5% (87%) respectively. The contingency table provides all by-class values (Appendix 7.14.1). A detailed evaluation of each mapped class at Level 4 is given in Table 10.

Table 10. Class-by-class evaluation of mapping accuracy at fuzzy Level 4.

Class	Producer's Accuracy	User's Accuracy	Explanation
Maritime Holly Forest	88.9%	85.7%	This type was very similar to Maritime Deciduous Scrub Forest and was considered the same at Level 4.
Old Field Red-Cedar Forest	100%	100%	The type was easily identified and limited to two large stands on the Floyd Estate.
Maritime Post Oak Forest	0%	0%	Only one stand was identified as this type. That stand was classified as Coastal Oak-Heath Forest during accuracy assessment.
Coastal Oak-Heath Forest	100%	88.9%	This type was most often confused with Pitch pine - Oak Forest which differs only in amount of <i>Pinus rigida</i> in the canopy.
Japanese Black Pine Forest	75%	78.6%	This type was most often confused with Pitch Pine Dune Woodland. The two types were considered the same at Level 4.

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Pitch Pine – Oak Forest	100%	85.7%	The photointerpreters felt that some polygons on the Floyd Estate were more appropriately assigned to this class rather than the Coastal Oak-Heath Forest. This type was very similar to the Coastal Oak –Heath type and was considered to be the same thing at Level 4. This type may actually be a product of a more oak dominated canopy with dense <i>Smilax</i> spp. beneath.
Pitch Pine Dune Woodland	81.3%	83.3%	This type was often found in small, linear, polygons, which may account for confusion with non-coniferous associations. Considered the same as Japanese Black Pine Forest for Level 4.
Northern Dune Shrubland	57.1%	76.9%	There is no clear pattern of confusion beyond other shrubs, although some confusion (with herbaceous types) is due to complex polygon interspersions and small polygons.
Maritime Deciduous Scrub Forest	68.0%	64.7%	Nearly all of the confusion with this type occurs with other shrub associations such as Highbush Blueberry Shrub Forest. This type was considered the same as Maritime Holly Forest at Level 4.
Maritime Vine Dune	25.0%	25.0%	This type is difficult to identify both from photography and in the field. It is closely associated with Northern Dune Shrubland and is often confused with it. It is also a rare type on Fire Island.
Highbush Blueberry Shrub Forest	50.0%	20.0%	This type is frequently confused with the other, more common wetland shrub types Maritime Deciduous Scrub Forest and Northern Salt Shrub.
Northern Salt Shrub	60.0%	57.9%	This type is frequently confused with other wetland types such as Highbush Blueberry Shrub Forest. <i>Phragmites australis</i> is found frequently within these stands as well.
Beach Heather Dune	81.5%	86.4%	This type exists both as an association and with Northern Beach Grass Dune in mosaic. Errors are thought to occur in smaller polygons juxtaposed with Northern Beach Grass Dune and Northern Dune Shrubland.
Northern Interdunal Cranberry Swale	100%	40%	No single polygon of this association exists at the 0.25 MMU. These accuracy estimates are from small polygons. This type may be over-predicted on the landscape because it is easily confused with small herbaceous wetlands that are also filled with water at the time of photo acquisition.
Northern Beach Grass Dune	87.5%	76.9%	This is the most prevalent association on Fire Island. It is part of a mosaic with Beach Heather Dune and most observed confusion is likely due to smaller polygons interspersed with that and Northern Dune Shrubland.

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Overwash Dune Grassland	0%	0%	This type was very limited in distribution on Fire Island. Although several polygons were labeled as this type, none were identified as such in the field. This type is easily confused with Beach Heather Dune or Northern Beach Grass Dune which further confounds mapping efforts.
Brackish Interdunal Swale	66.7%	50.0%	This wetland type was often delineated with adjacent Reedgrass Marsh. It is also a rare type on Fire Island existing in polygons at or below the 0.25 ha MMU
Brackish Meadow	100%	20.0%	Although this type occurs all over Fire Island, it is found in narrow bands or small polygons often associated with Reedgrass Marsh. Only 1 field assessment point was located within this type.
Reedgrass Marsh	58.8%	64.7%	Low accuracy is likely due to small sample size in the accuracy assessment set. This type was almost exclusively confused with other wetland types. Variable coverage density of <i>Phragmites australis</i> in other types may lead to confusion.
Low Salt Marsh	97.3%	100%	This type was most often confused with High Salt Marsh. Photointerpretation was mostly determined by presence of water in the photographs which is highly variable (tides, season). This type was considered the same as High Salt Marsh for Level 4.
High Salt Marsh	81.3%	100%	This type is found in close proximity and intermingled with the Low Salt Marsh type. These two were considered the same for the Level 4 assessment.
Northern Sandplain Grassland	0%	0%	This type was only mapped in a single small polygon and was identified elsewhere during accuracy assessment. It is a very rare type and likely exists in very few small patches. Further confounding this type is its similarity to Northern Dune Shrubland.
Cultivated Pasture	100%	100%	This type is easily identified on the Floyd Estate.
Interdune Beachgrass-Beach Heather Mosaic	100%	89.5%	This mosaic was considered correct if identified as either Northern Beach Grass Dune or Beach Heather Dune. There is likely much more of this type on Fire Island, but the sub-0.25 ha polygons make its appearance in the map more rare.